Sepsis

Mr Colin Dibble
Consultant in Emergency Medicine
North Manchester General Hospital

Case studies

Case study

- A 55 year old man is admitted to the resuscitation room with SOB.
- He has been unwell for the past 48hrs with a productive cough, lethargy and fever.
- On arrival :
  - Temp. 38.5^{o}C
  - RR 40/min
  - HR 130 beats per minute
  - BP 70/40
  - SpO2 90% (on 15 lpm via non-rebreathe)

What would you do next?

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- Give 100% oxygen
- Take blood cultures
- Give antibiotics
    - Which?
- Cannulate and start IVI 20ml/kg
- Check haemoglobin and lactate
- Catheterise, monitor urine output

pH	7.25
pCO2	3.34 kPa
pO2	8.11 kPa
HCO3-std	12.1 mmol/l
BE (B)	-11.4 mmol/l
Lactate	3.17 mmol/l

What does this mean?

Acidosis or alkalosis?

Respiratory or metabolic?

Examine the chest, X ray and cultures!

Arterial Blood Gases

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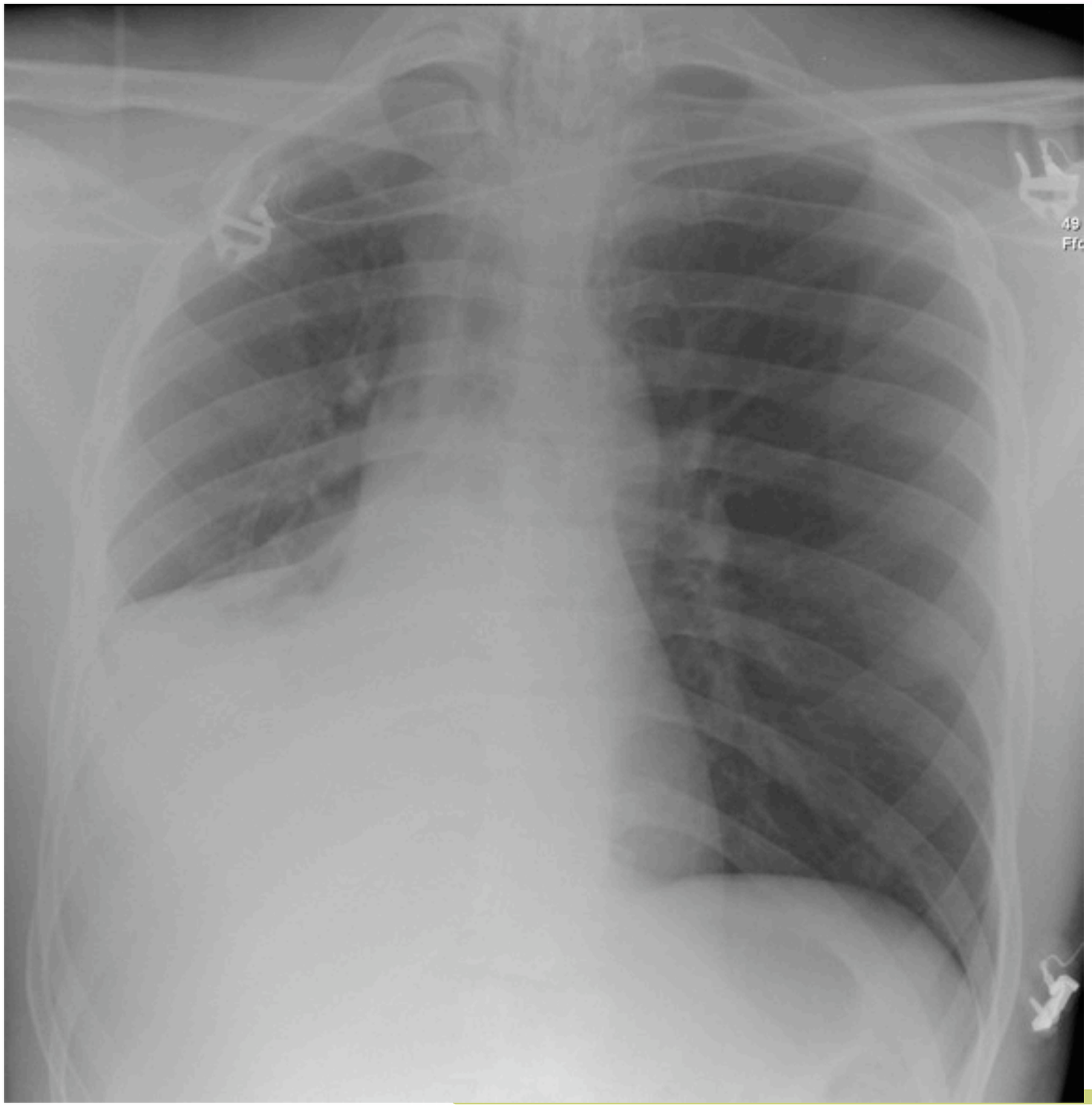
Diagnosis

Severe sepsis with shock secondary to pneumonia



Case Study 2:

- An 85 year lady, discharged from hospital 3 days ago is re-admitted to EAU from her nursing home.
- PMH:
  - Dementia
  - Hypertension
  - malnourished
- She has not been taking her medications.
- Incontinent 2/7, catheterised by district nurses.
- She has become increasingly confused over the last two days.

What are the issues here?

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- Risk factors:
  - elderly
  - malnourished
  - dementia- may present late
  - recent hospital stay
  - not compliant with medication
- Likely urinary tract infection
- What would you do now?

Continued…

A Self-maintained

B RR 18/min

C HR 110/min, BP120/60

Urine output 30ml in last 5 hours

D Confused, responds to voice

E Catheter in situ. Temp 35.4^{O}C

What here concern you the most?

What would you do now?

- Diagnosis:
  - Severe sepsis, probably with shock, secondary to UTI

- Give 100% oxygen
- Take blood cultures
- Give antibiotics
  - Which?
- Cannulate and start IVI 20ml/kg
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- 28 year old man post chemotherapy.
- Know to have multiple myeloma
- What is the concern here?

INVOLVE HAEMATOLOGY AND MICROBIOLOGY

- Give 100% oxygen
- Take blood cultures
- Give antibiotics
  - Which?
- Cannulate and start IVI 20ml/kg
- Check haemoglobin and lactate
- Catheterise, monitor urine output

Survive™ SEPSIS

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- A Self maintained
- B RR 18/min
- C HR 95, BP 120/80, CR<3s
- D Alert
- E Hickman line in situ
- Temp 38.5^{0}C
- last neutrophil count 0.5

»What now?

Contents

- Introduction
- Pathophysiology
- Definitions
- Clinical Presentation
- Management& Sepsis Bundles
- Complications

Is sepsis important?

- Risen by 329% in 20 years
- High mortality
- Worldwide 1400 deaths a day
- Most common cause of death in ICU
- 30% of patients on UK ICU have it
- Where in the league table of causes of death?

A U.K. Perspective

ICNARC data 6 months	Severe sepsis or septic shock
Admissions	Total 21,025
ICU mortality n(%)	Total 6,534 (31.1%)
Hospital mortality n(%)	Total 8,372 (39.8%)

Raw data, prior to adjustment for 65% submission, 70% admission

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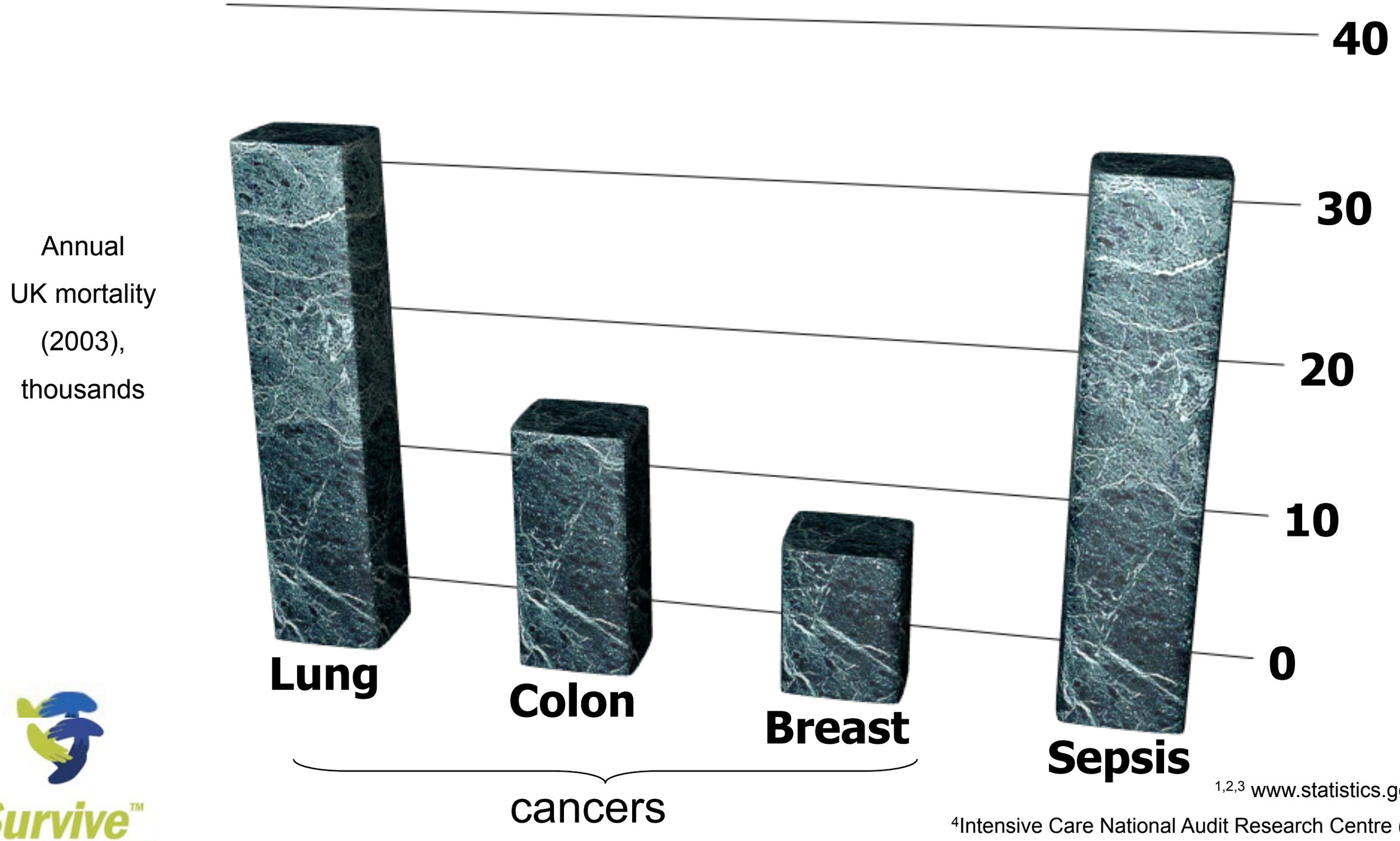

[1,2,3] www.statistics.gov.uk,,

[4]Intensive Care National Audit Research Centre (2005)

Pathophysiology

- Stage 1; local cytokine release in response to insult
- Stage 2; small release of cytokines into circulation with growth factor stimulation and attraction of macrophages and platelets
- Stage 3; significant systemic reaction with widespread activation of reticular endothelial system and numerous humoral cascades, mediators include prostaglandins, IL-1, IL-6, IL-8, IFN-Ɣ, TNF-a and activation of the coagulation cascade
- Causes widespread vasodilation, leaky capillaries, microvascular thrombosis. This leads to hypovolaemia, damage to kidneys, liver, brain, gut, DIC.

Clinical Presentation

- May have a history of fevers/chills/ sweats
- Keep high index of suspicion:
- SSI, ≧2:
  - T >38˚C/<36˚C
  - Resp >20/min
  - P >90 bpm
  - WBC >12 or <4 x10^9/L
  - Altered mental state
  - BM>6.6 in absence DM
- Sepsis: SSI and infective source- CNS, lungs, UTI, abdomen, skin, central line, etc.
- Beware chemo (neutropaenic) patients, HIV etc
- Initially hyperdynamic later hypodynamic circulation

ACCP/SCCM Consensus Definitions

- Infection
  - Inflammatory response to microorganisms, or
  - Invasion of normally sterile tissues
- Systemic Inflammatory Response Syndrome (SIRS): now known as SSI
  - Systemic response to a variety of processes
- Sepsis
  - Infection plus
  - ≥2 SSI criteria
- Severe Sepsis
  - Sepsis
  - Organ dysfunction
- Septic shock
  - Sepsis
  - Hypotension despite fluid resuscitation

Bone RC et al. *Chest.* 1992;101:1644-55.

What is Severe Sepsis?

Sepsis with organ dysfunction, hypoperfusion or hypotension

CNS:	Acutely altered mental status
CVS:	Syst <90 or mean <65 mmHg
Resp:	SpO_2 >90% only with new/ more O_2
Renal:	Creatinine >175 mmol/l
	or UO <0.5 ml/kg/hr for 2 hrs
Hepatic:	Bilirubin >34 mmol/l
Bone marrow:	Platelets <100
Hypoperfusion:	Lactate >2 mmol/l
Coagulopathy:	INR>1.5 or aPTT>60s

Septic Shock

- Defined as
  - Systolic <90 mmHg
  - Mean <65 mmHg
  - Drop of >40 mmHg from patient's normal systolic
  - Lactate >4 mmol/l

Elderly

- Non-specific in elderly and young. Hypotension/ collapse ?cause esp. in elderly
- Altered mental status
- Elderly, 'off legs', weakness, fatigue, LOA, hypothermia
- Predictors of bacteraemia in elderly; >50yrs/ WBC>15/DM/ESR>30 and Neutrophil band count>1500.

Paediatrics

- Petechiae/purpura in skin
- Fitting
- Hypothermia, esp <3/12
- Fever with no source and unwell, hypotonia, irritability
- Neonates, 'off feeds', fits, jaundice
- Tachypnoea and retractions, initially warm peripheries, later cool, mottling and CRT>2s
- Gp B *Streptococcus*/*E. coli* in first month, *N. meningitidis*/*HIB* in young children, *N. meningitidis*/Gp B *Streptococcus* in school age

Investigation

- FBC, raised WBC
- U&E, altered renal function
- ABG's, metabolic acidosis, raised lactate, low $p0_2$ in ARDS
- CXR, urinalysis looking for source
- LP in neonatal screen (NOT in A&E!)
- Blood cultures (positive in 20-40% sepsis, 40-70% septic shock)

Treatment

- O_2 15L/min via reservoir bag mask
- IV line(s) with large cannula(e) and aggressive crystalloid infusion
- Initiate appropriate investigations
- Head down if hypotensive
- IV antibiotics as soon as cultures taken, empiric (tazocin + gentamycin) or based on likely source
- May need HDU/ICU input
- If still low BP, needs CVP and maybe then inotropic support

The Surviving Sepsis Campaign Resuscitation Bundle

- Serum lactate measured
- Blood cultures obtained prior to antibiotic administration.
- From the time of presentation, broad-spectrum antibiotics administered within 3 hours for ED admissions and 1 hour for non-ED ICU admissions.
- In the event of hypotension and/or lactate >4mmol/L (36mg/dL):
  - Deliver an initial minimum of 20 ml/kg of crystalloid (or colloid equivalent)
  - Give vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) ≥ 65 mm Hg.
- In the event of persistent arterial hypotension despite volume resuscitation (septic shock) and/or initial lactate >4 mmol/L (36 mg/dl):
  - Achieve central venous pressure (CVP) of ≥8 mm Hg
  - Achieve central venous oxygen saturation (ScvO2) ≥70%

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… within 6 hours of onset!

Complications

- ARDS
- Renal failure (ATN)
- Thrombocytopaenia (10-30%), DIC
- Polyneuropathy if ventilated for a long time, difficulty weaning and distal motor weakness
- Increased mortality with increasing organs involved,
- reduced with drotrecogin, (activated Protein C) (severe sepsis with 2 or more organs failing=NICE guideline) £4905/ course excl. VAT

- Everyone has the potential to get sepsis
- Patients by definition have a high risk of sepsis
- Easy to identify – we know what we're looking for
- Tools – MEWS, Clinical Acumen and Experience
- Sepsis Screening Tool

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Summary

Sepsis Six

- Oxygen
- Blood Cultures
- Antibiotics
- Fluids
- Lactate & Hb
- Insert Catheter & monitor urine output

- within 1 hour
- Then ensure Critical Care assistance if shocked to complete EGDT

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